

REMARKS

Claims 1-26 are all the pending claims, with claims 1, 7, and 18 being written in independent form. By virtue of this Amendment, Applicant adds new claims 25 and 26.

The Examiner continues to reject claims 1, 4, 7, 8, 12-14, and 18-20 under 35 U.S.C. 103(a) as being obvious over U.S. 6,285,662 to Watanabe et al. ("Watanabe") in view of U.S. 6,614,799 to Gummalla et al. ("Gummalla"); and claims 2, 3, 9-11, and 24 under 35 U.S.C. 103(a) as being obvious over Watanabe in view of Gummalla, and further in view of U.S. 6,172,983 to Shaffer et al. ("Shaffer"). Applicant respectfully traverses all of these rejections in view of the following remarks.

I. The Previous Arguments are Still Valid:

Comparing the final rejection to the Examiner's previous Office Action, it appears that large portions of the final rejection are word-for-word identical to the rejections previously made. Applicant still believes that the Examiner is incorrect in his reasoning for essentially the same reasons presented in the February 20, 2004 Amendment. For example, the Examiner's reliance upon the secondary reference to Gummalla is misplaced. Gummalla's straightforward disclosure teaches the conventional exponential back-off algorithm discussed in the background section of the present application. That is, the size of the back-off delay window is expressed as a power of two. According to this algorithm, the exponent value is incremented by one each time a collision is detected. Thus, each detected collision necessarily causes the size of the back-off delay window to double.

II. The Response To Arguments Section of the Office Action:

In the Response to Arguments section of the Office Action, the Examiner counters by citing various portions of Gummalla that are alleged to teach features that are pertinent to the claimed invention. Applicant respectfully submits, however, that each of the cited portions bolsters Applicant's traversal positions (not the Examiner's rejection positions). Each of the cited portions is discussed separately below.

A. Paragraph 5 of the Office Action (Claim 1):

At paragraph 5 of the Office Action, the Examiner cites col. 11, lines 21-37; and col. 18, lines 18-23 of Gummalla to allegedly teach that the obtained back-off delay window "is less than two times a preceding back-off delay window," as recited in claim 1. Applicant disagrees.

Col 11, lines 21-37 of Gummalla indicate:

*Each cable modem in the network uses the back-off parameters to determine a range of possible back-off values. For example, in MCNS protocol the cable modems use a truncated binary **exponential back-off algorithm** to determine the number of contention minislots to defer before retrying. The CMTS specifies the window of values ([back-off_start, back-off_end]) to be used by the cable modems to decide how many contention minislots to defer. **The size of the window is controlled by the current back-off exponent (specified as a power of 2) at the cable modem.** For example, if the current value of the back-off exponent at a particular cable modem is 3, the modem will choose a random number from the values within the range $[0, 2^3 - 1]$, which translates to the range $[0, 1, 2, \dots 7]$. Once a random number has been selected from this range (the random number being the back-off value), the modem will attempt to retransmit to CMTS after it has deferred a number of contention slots equal to the selected random number. (emphasis added).*

As described above, the size of the window is specified as a power of 2. In the given example, the exponent is 3. Thus, a first window includes a total of 8 numbers (i.e., [0, 1, 2, ..., 7]). If another collision is detected, the exponent is increased by 1. (See col. 11, lines 39-43). Here, a second window would include a total of 16 numbers (i.e., [0, 1, 2, ..., 15]). The second window has twice as many numbers as the first window. Certainly then, Gummalla does not teach or suggest obtaining a back-off delay window that "is less than two times a preceding back-off delay window," as recited in claim 1.

The Examiner's comments seem to intimate a belief that the random back-off value is pertinent to claim 1. However, the random back-off value is a single value that is chosen from the window of values. That is, the chosen number merely indicates the number of contention slots (or time slots) that the modem will defer before retransmitting the data packet. The chosen number is not, however, pertinent to the size of the window (i.e., the number of possible values that may be selected). In short, the random back-off value does not control the size of the window, as alleged by the Examiner.

Col. 18, lines 21-37 of Gummalla indicate:

Thus, if the value of the expression $BS+2$ is less than 15, the back-off end parameter will be set equal to $BS+2$ in step 512. However, if the value of the expression $BS+2$ is greater than 15, the back-off end parameter will be set equal to 15 in step 512. It is to be noted, that other maximum values for the back-off end parameter may be used where appropriate.

This portion of the disclosure relates to a technique in which back-off parameters (i.e., back-off start value "BS" and back-off end value "BE") may be adjusted to obtain a desired ratio of the number of collisions (N_c) to the number of successful transmissions (N_s). BS and BE represent the range of exponent values to be used by the modem to determine the window size. (See col. 11, lines 4-22). For example, if $BS = 3$ and $BE = 8$, the modem will

determine the first window size as 2^{BS} (or 2^3); i.e., the window of values would include 0, 1, 2, ..., 7. If a collision occurs, then the modem will determine the second window size as 2^{BS+1} (or 2^4). If another collision occurs, then the modem will determine the third window size as 2^{BS+2} (or 2^5), and so on.

However, this disclosure does not somehow detract from the straightforward disclosure indicating that the window is specified as a power of 2, and that the exponent is increased by 1 when a collision is detected. That is, for a given set of back-off parameters BS, BE, each detected collision experienced by a transmitted packet necessarily causes the size of the back-off delay window to double.

B. Paragraph 7 of the Office Action (Claim 7):

At paragraph 7 of the Office Action, the Examiner cites col. 14, lines 10-25; and col. 17, lines 23-35 of Gummalla to allegedly teach that the obtained back-off delay window "is equal to a preceding or future back-off delay window," as recited in claim 7. Applicant disagrees.

Col 14, lines 10-25 of Gummalla indicate:

*Thus, from the above equations, when **theoretically ideal back-off values** have been chosen by each cable, modem contending for upstream access to the CMTS (e.g., a back-off value equal 1/500 for 500 contenders), the ratio of N_c/N_s will approach the value 0.718. Therefore, as the back-off value selected by each cable modem in the network contending for upstream access (to the CMTS) approaches its **theoretically optimal value**, the ratio of N_c/N_s should start approaching the value 0.7, approximately. If the selected back-off values are not correct, then the resulting ratio of N_c/N_s would diverge from the value 0.718. The present inventive technique for dynamically adjusting modem back-off parameters utilizes this **concept** to correspondingly correct the back-off parameters, depending upon the value of the N_c/N_s*

ratio, so as to cause this ratio to converge to the desired ratio of N_c/N_s equal to approximately 0.7. (emphasis added).

This portion of the disclosure relates to a theory for maximizing throughput in a cable modem system. It does not, however, teach or suggest any specific details of a practical embodiment. At least in this regard, the Examiner's reliance upon Gummalla is misplaced.

Furthermore, the theory is directed to adjusting the back-off parameters BS and BE. However, it does not somehow detract from the straightforward disclosure indicating that the window is specified as a power of 2, and that the exponent is increased by 1 when a collision is detected. That is, for a given set of back-off parameters BS, BE, each detected collision experienced by a transmitted packet necessarily causes the size of the back-off delay window to double. Certainly then, the cited portion of Gummalla is not pertinent to obtaining a back-off delay window that "is equal to a preceding or future back-off delay window," as recited in claim 7.

Col 17, lines 23-35 of Gummalla indicate:

It is to be understood, however, that other maximum values may be used where appropriate. For example, a smaller maximum value for the back-off start parameter may be appropriate in cable modem networks having relatively few cable modems. On the other hand, larger maximum values for these back-off start parameter may be appropriate, for example, in networks where the CMTS services millions of cable modems. The function $\text{MIN}(BS+1, 15)$ chooses the smaller value of either the value 15 or the value resulting from the expression $BS+1$. Thus, if the value of the expression $BS+1$ is greater than 15, the back-off start value will be set equal to 15. If, however, the value of the expression $BS+1$ is less than 15, the back-off start value will be set equal to the value of $BS+1$.

This portion of the disclosure relates to a technique in which the back-off parameters BS and BE may be adjusted. However, it does not somehow detract from the straightforward disclosure indicating that the window is specified as a power of 2, and that the exponent is increased by 1 when a collision is detected. That is, for a given set of back-off parameters BS, BE, each detected collision experienced by a transmitted packet necessarily causes the size of the back-off delay window to double.

C. Paragraph 9 of the Office Action (Claim 18):

At paragraph 9 of the Office Action, the Examiner cites col. 20, lines 1-22 of Gummalla to allegedly teach that the obtained back-off delay window is “greater than a smallest back-off delay window,” as recited in claim 18. Applicant disagrees.

Col 20, lines 1-22 of Gummalla indicate:

If, however, the ratio of $\Delta N_c/\Delta N_s$ is greater than one, as shown in region C of FIG. 5, then the value of the back-off parameters BS and BE, are increased by respective constant values.

FIG. 6 shows an alternate embodiment of the present invention wherein the adjustment to the back-off parameter values is proportionately related to the ratio of $\Delta N_c/\Delta N_s$ value. As described above in reference to FIG. 4 and as shown in FIG. 5, the back-off parameter values are either incremented or decremented by a constant value or values when the ratio of $\Delta N_c/\Delta N_s$ falls outside of the range [0.25, 1]. Thus, as shown in FIG. 5, where the ratio of $\Delta N_c/\Delta N_s$ is less than 0.25, the value of the of the back-off start parameter is decreased by a constant value as shown in region A of FIG. 5. However, as shown in region A of FIG. 6, as the ratio of $\Delta N_c/\Delta N_s$ decreases below the value 0.25, the amount of adjustment made to the back-off start parameter increases (in a negative direction). Similarly, as shown in region C of FIG. 6 as the ratio of $\Delta N_c/\Delta N_s$ increases

past 1.0, the amount of adjustment to the back-off start parameter is proportionately increased. The techniques shown in FIG. 6 has the advantage of increased sensitivity in the dynamic response and adjustment of the modem back-off parameters.

As noted in the February 20, 2004 Amendment, Gummalla indicates that the back-off start value BS (for a transmission) may be increased or decreased. However, the increase or decrease is based on an evaluation of the total number of collisions N_c and successful transmissions N_s on a particular channel. Indeed, if the total number of collisions and successful transmissions on a particular channel remain the same from one transmission to the next, then the back-off start BS value would remain the same. This is in contrast to claim 18 in which the decrease in the block-off delay window occurs when a data packet has been transmitted without contention.

Consider the following example. If $BS = 3$ and $BE = 8$, Gummalla's modem will determine the first (smallest) window size as 2^{BS} (or 2^3); i.e., the window of values would include 0, 1, 2, ... , 7. If a collision occurs, then the modem will determine the second window size as 2^{BS+1} (or 2^4). If the data packet is successfully transmitted (i.e., without contention), then the back-off delay window for the next data packet transmission would again be determined to have a size of 2^{BS} (or 2^3). Certainly then, Gummalla is not pertinent to obtaining a back-off delay window that is "greater than a smallest back-off delay window," as recited in claim 18.

CONCLUSION

For these reasons, Applicant respectfully submits that claims 1, 7, and 18 are patentable, and that claims 2-6, 8-17, and 19-26 are patentable at least by virtue of their dependencies. Accordingly, an early indication of the allowability of all of the pending claims is earnestly solicited.

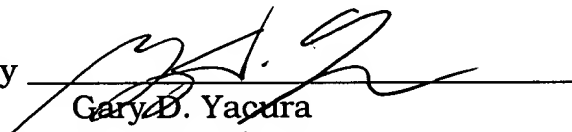
Amendment Under 37 C.F.R. § 1.116
U.S. Appln. No. 09/652,153
Attorney Docket No. 29250-000434/US

If any matters remain at issue in the application, the Examiner is invited to contact the undersigned at (703) 668-8000 in the Northern Virginia area, for the purpose of a telephonic interview.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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